





10th June

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A REVISED LIST OF THE CRUSTACEA OF THE FIRTH OF
FORTH. By THOMAS SCOTT.

In 1880-81 a list of the Invertebrate Fauna of the Firth of Forth was published by Leslie and Herdman in the *Proceedings of the Royal Physical Society of Edinburgh*,* in which were enumerated all the species of Crustacea belonging to the Cirripedia, Amphipoda, Isopoda, Cumacea, Schizopoda, and Decapoda, then known to occur in the estuary, but leaving out the Copepoda and Ostracoda.

In December 1884, Professor J. R. Henderson, in a paper read before the same Society,† recorded several additions to Leslie and Herdman's list, the Entomostraca being again left out. Professor Henderson, however, expressed the hope that he would yet be able 'to form lists of these 'more minute, though not the less interesting organisms;' but this hope does not appear to have been realised.

Seeing that the Entomostraca, and especially the Copepoda, form such an important part of the food of certain fishes, it is rather surprising that they should have been passed over from time to time by local naturalists.

During the latter half of 1887 I was at various times engaged on board the 'Garland,' assisting in collecting data required in connection with the trawling experiments carried on under the direction of Professor Ewart and Sir James Maitland, Bart. Excellent facilities were thus afforded for gaining a knowledge of the variety and distribution of the fauna of the Forth, and, acting on the instructions of Professor Ewart, a record was made of all the organisms observed, including the Copepoda and Ostracoda; and as further additions to the lists of Crustacea already published have also been made, I propose in the following paper to give a record of the species of Crustacea now known to occur in the Forth estuary—the parasitic Copepoda (fish-lice) excepted, which will be dealt with in a separate paper later on.

It will be understood that this record is not to be considered exhaustive; the Forth will have to be more thoroughly investigated before the preparation of an exhaustive list can be attempted. Meantime, in order to make this one as complete as possible, several species recorded in the papers previously referred to are included, though they have not yet been observed during the Board's investigations, and some additional stations for a few of the rarer forms have also been added on the same authority. In preparing the list of Copepoda the classification and nomenclature adopted by Dr G. S. Brady in his monograph ‡ have been followed. For the Ostracoda, the *British Entomostraca*, by Dr Baird, and various lists by David Robertson, F.L.S., and others, have been consulted. The valuable monograph of the *British Sessile-eyed Crustacea*, by Bate and Westwood, is still the standard work on the British Amphipoda and Isopoda; but as within recent years considerable changes have been made in the nomenclature of these groups, it has been thought advisable to follow that adopted in Part III. of the *Museum Normanianum*,—a series of catalogues which are being published for private distribution by the Rev. Canon Norman, D.C.L., F.L.S. Advantage has also been taken of these catalogues to correct the nomenclature of the other groups. The *British Stalk-eyed Crustacea*, by Professor Bell, the *Popular History of British Crustacea*, by White, and other works, have also been consulted. I wish also to acknowledge

* *Proc. Roy. Phys. Soc. Edin.*, vol. vi. pp. 215, 313 (1880-81).

† *Proc. Roy. Phys. Soc. Edin.*, vol. viii. p. 307 (1883-85).

‡ *British Copepoda*, 1878-80.

the continued kindness of Dr G. S. Brady, F.R.S., and the Rev Canon Norman, in examining doubtful species. One of the staff of the Board has at various times visited the coast about Joppa, Cramond, and other places, and has collected material for me which has proved very useful by adding to our knowledge of the distribution of various forms, two species of Schizopoda having been added to the Forth fauna in this way. Finally, Professor Cossar Ewart has afforded me encouragement and help in many ways in prosecuting the study of marine organisms, which I feel it to be my duty to acknowledge here.

CIRRIPEDIA.*

PELTOGASTRIDÆ.

Peltogaster paguri, Rathke.

Peltogaster paguri, Anderson, Proc. Roy. Phys. Soc. Edin., vol. ii. Occasionally on *Pagurus Bernhardus*, in the littoral zone, and also in deep water. Joppa (Dr J. Anderson); east of May Island (S.F.B.).

Peltogaster carcini, Anderson.

Peltogaster carcini, Anderson, Proc. Roy. Phys. Soc. Edin., vol. ii. Joppa (Dr J. Anderson).

Sacculina carcini, Thompson.

Sacculina carcini, Leslie and Herdman, Proc. Roy. Phys. Soc. Edin., vol. vi. p. 215. Occasionally attached to the abdomen of *Carcinus mænas*. Firth of Forth (Dr Anderson); Gulland Bay (S.F.B.).

Sacculina triangularis, Anderson.

Sacculina triangularis, Anderson, Proc. Roy. Phys. Soc. Edin., vol. ii. Firth of Forth (Dr J. Anderson).

LEPADIDÆ.

Lepas anatifera, Linné.

Lepas anatifera, Darwin, Mon. Lepadidæ, p. 73, Tab. i. fig. 1, 1851. Attached to floating timber, Firth of Forth (Ed. Mus., L. & H.).

Conchoderma virgata, Spengler.

Conchoderma virgata, Darwin, Mon. Lepadidæ, p. 146, Tab. iii. fig. 2, 1851. On floating timber, Firth of Forth (Ed. Mus., L. & H.).

Conchoderma auritum, Linné.

On floating timber, Firth of Forth (Ed. Mus., L. & H.).

BALANIDÆ.

Balanus balanoides, Linné.

Balanus balanoides, Darwin, Mon. Balanidæ, p. 267, pl. vii. figs. 2a-2d, 1854. Common on rocks and stones between tide-marks and also in deep water.

Balanus porcatus, Da Costa.

Balanus porcatus, Darwin, Mon. Balanidæ, p. 256, pl. vi. figs. 4a-4c, 1854. "Not uncommon, attached to stones," &c. (L. & H.).

* In the following list the letters S.F.B. indicate that the species and locality are discovered during the investigations of the Scottish Fishery Board; the letters L. & H. indicate that the authority is that of Leslie and Herdman, in the above-mentioned work.

Balanus crenatus, Bruguière.

Balanus crenatus, Darwin, Mon. Balanidæ, p. 261, pl. vi. figs. 60-69, 1853. Portobello (Ed. Mus., L. & H.) frequent; east of Inchkeith (S.F.B.).

Balanus hameri, Ascanius.

Balanus hameri, Darwin, Mon. Balanidæ, p. 277, pl. vii. figs. 5a-5c. Largo Bay and west of Inchkeith, single specimens, and occasionally in colonies, attached to pieces of wood, but not very common (S.F.B.).

Verrucca stromia, Müller.

Frequent on stones brought up in the dredge east of Inchkeith (S.F.B.).

Remarks.—*Balanus tintinnabulum*, Lin., included in the *Invertebrate Fauna of the Firth of Forth*, though frequently brought to our shores attached to ships' bottoms, has no claim to be considered a British species.

COPEPODA.

CALANIDÆ, Dana.

Calanus finmarchicus, Gunner.

Calanus finmarchicus, Brady, Mon. Brit. Cop., vol. i. p. 38, 1872. Frequent in surface tow-net gatherings in all parts of the estuary, but does not seem to be so common as it is in the Firth of Clyde.

Pseudocalanus elongatus, Boeck.

Pseudocalanus elongatus, Brady, Mon. Brit. Cop., vol. i. p. 45, 1872.

Clausia elongata, Norman, Mus. Nor., pt. iii., 1886. Frequent in surface tow-net gatherings; distribution similar to the last.

Dias longiremis, Lilljeborg.

Dias longiremis, Brady, Mon. Brit. Cop., vol. i. p. 51, pl. v. figs. 1-14, 1872. Equally frequent with the last two.

Temora longicornis, Müller.

Temora longicornis, Brady, Mon. Brit. Cop., vol. i. p. 54, pl. iii. figs. 10-19.

Temora longicaudata, Norman (Lubbock), Mus. Nor., pt. iii., 1886. Also of frequent occurrence.

Temora velox, Lilljeborg.

Temora velox, Brady, Mon. Brit. Cop., vol. i. p. 56, pl. vi. figs. 1-5, 1878.

Temorella velox, Norman, Mus. Nor., pt. iii., 1886. Very frequent in surface gatherings taken off Bo'ness, and inshore about South Queensferry; this is rather a brackish water than a marine species, and its occurrence in the upper parts of the estuary may be due to the large admixture of fresh water there.

Centropages typicus, Kröyer.

Centropages typicus, Brady, Mon. Brit. Cop., vol. i. p. 65, pl. viii. figs. 1-10, 1878. Occasionally in surface gatherings, but not very common (S.F.B.).

Centropages hamatus, Lilljeborg.

Centropages hamatus, Brady, Mon. Brit. Cop., vol. i. p. 67, pl. viii. figs. 11-13, 1878. More frequent than the last, though not very common; it has been observed in surface material from Gulland Bay, east of Inchkeith, and vicinity of May Island (S.F.B.).

Parapontella brevicornis, Lilljeborg.

Parapontella brevicornis, Brady, Mon. Brit. Cop., vol. i. p. 69, pl. xi. figs. 11-13, 1878. In surface nettings taken off Bo'ness; rather scarce (S.F.B.).

Anomalocera patersonii, Templeton.

Anomalocera patersonii, Templeton, Trans. Entom. Soc.; p. 35, t. v. figs. 1-3, 1837.

Irenæus patersonii, Goodsir, Edin. New Phil. Journ., vol. xxxv. p. 339, t. iv. figs. 12-17; t. iv. figs. 1-9, 1843.

This species was taken in considerable numbers with the surface net east of May Island. Its colours were light and dark green, no red being present as in many of the Clyde specimens (S.F.B.).

CYCLOPIDÆ, Baird (in part)

Oithona spinifrons, Boeck.

Oithona spinifrons, Brady, Mon. Brit. Cop., vol. i. p. 90, pl. xiv. figs. 1-9, and pl. xxiv. figs. 1, 2, 1878.

Oithina spinirostris, Norman (Claus), Mus. Nor., pt. iii. p. 23. Frequent in surface gatherings east of Inchkeith (S.F.B.).

Cyclopina littoralis, Brady.

Cyclopina littoralis, Brady, Nat. Hist. Trans., Northumberland and Durham, vol. iv. p. 427, pl. xvii. figs. 9-14, 1872. Mon. Brit. Cop., vol. i. p. 92, pl. xv. figs. 1-9, 1878. A few specimens in rock pools near low water at Cramond Island (S.F.B.).

Cyclops æquoreus, Fischer.

Cyclops æquoreus, Fischer, Abhandl. der Akad. der Wissenschaft, Bd. viii. p. 654, Taf. xx. figs. 26-29, 1860.

Cyclops æquoreus, Brady, Mon. Brit. Cop., vol. i. p. 119, pl. xix. figs. 8-10, and pl. xxi. figs. 10-17, 1880. One specimen, obtained in a pool above high-water mark, Cramond Island. This is the only British species of Cyclops having six-jointed antennæ, with the exception of one recently described by J. C. Thomson, F.L.S., which was taken off Puffin Island, near Anglesea. In some material from the mussel beds at the mouth of the River Eden in Fife, sent to me by Mr Simpson, Leuchars, there were several specimens of this species.

Cyclops Ewarti, n. sp.

This species, which was taken some miles west of Queensferry, is described by Dr Brady at p. .

NOTODELPHYIDÆ, Thorell.

Notodelphys Allmanni, Thorell.

Notodelphys Allmanni, Brady, Mon. Brit. Cop., vol. i. p. 126, pl. xxv. figs. 1-10, 1878. In branchial cavities of Ascidians dredged in various places, as about Inchkeith and Granton Harbour; not unfrequent (S.F.B.).

Notodelphys agilis, Thorell.

Notodelphys agilis, Brady, Mon. Brit. Cop., vol. i. p. 130, pl. xxvi. figs. 1-10, 1876. In branchial cavities of Ascidians, attached to the pier at Granton (S.F.B.).

Ascidicola rosea, Thorell.

Ascidicola rosea, Brady, Mon. Brit. Cop., vol. i. p. 145, pl. xxx. figs. 1-10, 1887. Occasionally in branchial cavities of Ascidians, but not common (S.F.B.).

Doropygus sp. (possibly *porcicauda*, Brady).

One specimen among dredged material from vicinity of Inchkeith (S.F.B.).

HARPACTICIDÆ, Claus (in part).

Longipedia coronata, Claus.

Longipedia coronata, Brady, Mon. Brit. Cop., vol. ii. p. 6, pls. xxxiv., xxxv., 1880. This is rather a common species in the Firth of Forth, occurring at times in considerable numbers, as among dredged material from a little west off Inchkeith, vicinity of Bass Rock, &c. Also frequent in Cromarty Firth, near Invergordon (S.F.B.).

Ectinosoma spinipes, Brady.

Ectinosoma spinipes, Brady, Mon. Brit. Cop., vol. ii. p. 9, pl. xxxvi. figs. 1-10, 1880. In dredged material from off North Berwick; a few specimens (S.F.B.).

Robertsonia tenuis, Brady and Robertson.

Robertsonia tenuis, Brady, Mon. Brit. Cop., vol. ii. p. 25, pl. xli figs. 1-14, 1880. In the same material as last; a few specimens (S.F.B.).

Amymone sphaerica, Claus.

Amymone sphaerica, Brady, Mon. Brit. Cop., vol. ii. p. 28, pl. xlix. figs. 1-11, 1880. A few specimens in material dredged in Gulland Bay and at west side of Inchkeith. Also not uncommon in material dredged near Invergordon, Cromarty Firth (S.F.B.).

Stenhelia ima, Brady.

Stenhelia ima, Brady, Mon. Brit. Cop., vol. ii. p. 35, pl. xliii. figs. 1-14, 1880. A few specimens in material dredged off North Berwick, and from rock pools between tide-marks, Cramond Island (S.F.B.).

Mesochra lilljeborgii, Boeck.

Mesochra lilljeborgii, Boeck, Oversigt Norges Copepoder, p. 51, 1864.

Paratachidius gracilis, B. and R., Ann. and Mag. Nat. Hist., ser. 4, vol. xii. p. 131, pl. viii. figs. 8-16, 1873.

Mesochra lilljeborgii, Brady, Mon. Brit. Cop., vol. ii. p. 62, pl. xli. figs. 15-21, and pl. xlvii. figs. 16-21, 1880. Frequent in rock pools near high-water mark, Cramond Island (S.F.B.).

Laophonte similis (Claus).

Cleta similis, Claus, Die Copepoden-Fauna von Nizza, t. v. p. 23, figs. 13, 14, 1866.

(?) — *forcipata*, Norman, Last Shetland Dredging Report, p. 29, 1868.

Laophonte similis, Brady, Mon. Brit. Cop., vol. ii. p. 78, pl. lxxv. figs. 1-14, 1880. Several specimens in rock pools between tide-marks, Cramond Island. Also in Cromarty Firth (S.F.B.).

Laophonte thoracica, Boeck.

Laophonte thoracica, Brady, Mon. Brit. Cop., vol. ii. p. 76, pl. lxxvii. figs. 1-8, 1880. Not unfrequent in material dredged off the west side of Inchkeith. This species is easily distinguished by the very long and slender second foot-jaws and first pair of fee. Also observed in Cromarty Firth, but not common (S.F.B.).

Laophonte curticauda, Boeck.

Laphonte curticauda, Brady, Mon. Brit. Cop., vol. ii. p. 80, pl. lxxiii. figs. 15-18, and pl. lxxvi. figs. 1-9, 1880. Two or three specimens among material dredged off North Berwick; rock pools, about high-water mark, Cramond Island (S.F.B.).

Laophonte lamellifera, Claus.

Cleta lamellifera, Claus, Die freilebenden Copepoden, p. 123, Taf. xv. figs. 21-25, 1863.

Laophonte lamellifera, Brady, Mon. Brit. Cop., vol. ii. p. 83, pl. lxxv. figs. 15-23, 1880. A few specimens in material collected between tide-marks, near Joppa, and in rock pools Cramond Island (S.F.B.).

Cletodes limicola, Brady.

Cletodes limicola, Brady, Mon. Brit. Cop., vol. ii. p. 90, pl. lxxix. figs. 1-12, 1880. Among material dredged off North Berwick in 10 to 14 fathoms, and Gulland Bay; rather scarce (S.F.B.).

Cletodes propinqua, Brady and Robertson.

Cletodes propinqua, Brady, Mon. Brit. Cop., vol. ii. p. 94, pl. lxxvii. figs. 9-17, 1880. In pools among heaped-up stones between tide-marks, Newhaven; between tide-marks, Cramond Island (S.F.B.). Also observed near Invergordon, in Cromarty Firth.

Dactylopus tisboides, Claus.

Dactylopus tisboides, Brady, Mon. Brit. Cop., vol. ii. p. 106, pl. liv. figs. 1-16, 1880. Of frequent occurrence in material collected between tide-marks about Joppa; rock pools, high-water mark, Cramond Island (S.F.B.).

Thalestris rufocincta, Norman.

Thalestris rufocincta, Brady, Mon. Brit. Cop., vol. ii. p. 125, pl. lvii. figs. 1-9, 1880. Frequent in material collected between tide-marks about Joppa and Granton (S.F.B.). Also observed in Cromarty Firth (S.F.B.).

Thalestris longimana, Claus.

Thalestris longimana, Brady, Mon. Brit. Cop., vol. ii. p. 136, pl. lx. figs. 1-13, 1880. One or two specimens, in material dredged off west side of Inchkeith; rock pools above high-water mark, Cramond Island (S.F.B.).

Westwoodia nobilis (Baird).

Harpacticus nobilis, Baird, Trans. Berw. Nat. Club, vol. ii. p. 155, 1845; Nat. Hist. Brit. Entom., p. 214, tab. xxviii. figs. 2-2a-e, 1850.

Westwoodia nobilis, Brady, Mon. Brit. Cop., vol. ii. p. 141, pl. lxiii. figs. 1-13, 1880. Not infrequent in rock pools, between tide-marks, about Cramond Island. Also near Invergordon, Cromarty Firth (S.F.B.).

Harpacticus chelifera (Müller).

Harpacticus chelifera, Brady, Mon. Brit. Cop., vol. ii. p. 146,

pl. lxxv. figs. 1-15, and pl. lxxiv. figs. 19, 20, 1880. One or two specimens in material collected between tide-marks west of Granton (S.F.B.). Also observed in Cromarty Firth (S.F.B.).

Harpacticus fulvus, Fischer.

Harpacticus fulvus, Fischer, Abhandl. der König. Bayer. Akad. Bd. viii. p. 656, Taf. i. figs. 30-33; Taf. ii. figs. 34-39, 1860.

Harpacticus fulvus, Brady, Mon. Brit. Cop., vol. ii. p. 149, pl. lxxiv. figs. 1-11. Very common in rock pools about high-water mark at Cramond Island (S.F.B.). This species occurs in rather unexpected places. Dr G. S. Brady has recorded it from 35 fathoms off the Yorkshire coast, and from Kinny Lough (a fresh-water loch, near the sea, in County Donegal). He explains its occurrence here by storms or excessively high tides carrying sea water into the loch, rendering it more or less brackish. Besides being recorded from several European localities it occurs at Kerguelen Island.

Zaus spinatus, H. Goodsir.

Zaus spinatus, Brady, Mon. Brit. Cop., vol. ii. p. 153, pl. lxxvi. figs. 1-9, 1880. Firth of Forth (H. Goodsir), in material collected between tide-marks about Joppa; frequent (S.F.B.).

Alteutha depressa, Baird.

Alteutha depressa, Baird, Trans. Berw. Nat. Club, vol. ii. p. 155, 1845.

Peltidium depressum, Brady, Mon. Brit. Cop., vol. ii. p. 160, pl. lxxii. figs. 1-5, 1880.

Alteutha purpurocincta, Norman, Brit. Assoc. Rep., p. 298, 1868. Several specimens among material dredged off west side of Inchkeith, and among material collected between tide-marks about Joppa (S.F.B.). Also of frequent occurrence in Cromarty Firth (S.F.B.).

Alteutha interrupta (Goodsir).

Alteutha interrupta, see Brady, Rep. Scot. Fish. Board, p. 328, 1886.

Peltidium interruptum, Brady, Mon. Brit. Cop., vol. ii. p. 162, pl. lxxi. figs. 4-15, 1880.

Peltidium depressum, Norman, Mus. Norm., part iii. Frequent in the Forth in shore and dredged material; about Joppa, Inchkeith, &c. (S.F.B.). Also observed in Cromarty Firth (S.F.B.).

Idya furcata (Baird).

Idya furcata, Brady, Mon. Brit. Cop., vol. ii. p. 172, pl. lxxvii. figs. 1-11, 1880. Frequent in shore material collected about Joppa, west of Granton; rock pools, about high-water mark, Cramond Island (S.F.B.).

SAPPHIRINIDÆ, Thorell.

Lichomolagus fucicolus, Brady.

Lichomolagus fucicolus, Brady, Mon. Brit. Cop., vol. iii. p. 41, pl. lxxxv. figs. 1-11, 1880. One specimen, in material dredged in Gulland Bay (S.F.B.).

ARTOTROGIDÆ, Brady.

Artotrogus Boeckii, Brady.

Artotrogus Boeckii, Brady, Mon. Brit. Cop., vol. iii. p. 60, pl. xci. figs. 1-9, 1880. A number of specimens of this species were taken in Granton Harbour; they were obtained by washing a specimen of *Chalinula oculata* found attached to the pier at extreme low water; they had probably been seeking shelter about the Sponge (S.F.B.).

Artotrogus magniceps, Brady.

Artotrogus magniceps, Brady, Mon. Brit. Cop., iii. pl. xciii. figs. 1-9, 1880. A few specimens, in material dredged west of Queensferry (S.F.B.).

Artotrogus papillatus, n. sp.

This species was dredged in deep water a little west of Inchkeith, and is described on p. .

Acontiophorus scutatus, Brady and Robertson.

Acontiophorus scutatus, Brady, Mon. Brit. Cop., vol. iii. p. 69, pl. xc. figs. 1-10, 1880. Occasionally among dredged material from the vicinity of Inchkeith (S.F.B.).

Remarks.—The preceding are all the species of Copepoda that have been identified, but there are several others, which, from their general distribution around our shores, may be expected to be yet found in the Forth. The following additional species have been observed in Cromarty Firth, near Invergordon—*Laophonte curticauda*, Boech; *Porcellidium fimbriatum*, Claus; *Cyclopicera nigripes*, B. and R., and *Cyclopicera Gracilicanda*, Brady—which do not appear to have been previously recorded from that district.

The Calanidæ, which include most of the free swimming or pelagic species, are the most important of the Copepoda in relation to the food supply of fishes and especially of young fishes. The majority of the others keep near the bottom, and seek shelter and possibly food among the forests of Algæ and Zoophytes. It is probable that Shrimps, Prawns, Schizopods, and other small Crustaceans feed on these, and they thus become, though indirectly, of nearly equal importance with the others. The greater number of the Calanidæ, and some of the Harpacticidæ, have already been recognised among the contents of the stomachs of herring and of the young of several species of Gadidæ; but a thorough and practical acquaintance with the group in their living state is required to enable one to identify them with anything like certainty in the stomach of fishes.

OSTRACODA.

CYTHERIDÆ.

Cythere lutea, Müller.

Cythere lutea, Brady, Trans. Lin. Soc., vol. xxvi. p. 395, pls. xxviii., xxxix., 1870. Gulland Bay, vicinity of Inchkeith; frequent (S.F.B.).

Cythere pellucida, Baird.

Cythere pellucida, Brady, *op. cit.*, p. 397, pls. xxviii., xxxviii. Largo Bay, Gulland Bay; not infrequent (S.F.B.).

Cythere tenera, Brady.

Cythere tenera, Brady, *op. cit.*, p. 399, pl. xxviii. Gulland Bay, deep water, west of May Island; not very common (S.F.B.).

Cythere crispata, Brady.

Cythere crispata, Brady, . Vicinity of Inchkeith, west side ; scarce (S.F.B.).

Cythere Robertsoni, Brady.

Cythere robertsoni, Brady . Gulland Bay, vicinity of Inchkeith ; not very common (S.F.B.).

Cythere villosa (G. O. Sars).

Cythere villosa, Brady, *op. cit.*, p. 411, pl. xxix. Gulland Bay, off Inchkeith, and other places ; a common species (S.F.B.).

Cythere convexa, Baird.

Cythere convexa, Brady, *op. cit.*, p. 401, pls. xxix., xxxix. One or two specimens dredged near Inchkeith (S.F.B.).

Cythere albomaculata, Baird.

Cythere albomaculata, Brady, *op. cit.*, p. 402, pls. xxviii., xxxix. In material dredged off Bo'ness ; a few (S.F.B.).

Cythere limicola (Norman).

Cythere limicola, Brady, *op. cit.*, p. 405, pl. xxxi. A few specimens dredged in Gulland Bay, and in deep water west of May Island (S.F.B.).

Cythere tuberculata (G. O. Sars).

Cythere tuberculata, Brady, *op. cit.*, p. 406, pl. xxx. In the same localities as last ; frequent (S.F.B.).

Cythere concinna, Jones.

Cythere concinna, Brady, *op. cit.*, p. 808, pls. xxvi., xxxviii. With the two previous ; frequent (S.F.B.).

Cythere angulata (G. O. Sars).

Cythere angulata, Brady, *op. cit.*, p. 409, pl. xxvi. A few specimens from deep water, west of May Island (S.F.B.).

Cythere quadridentata, Baird.

Cythere quadridentata, Brady, *op. cit.*, p. 313, pl. xxxi. One specimen, among material dredged off the west side of Inchkeith (S.F.B.).

Cythere Dunelmensis (Norman).

Cythere Dunelmensis, Brady, *op. cit.*, p. 416, pl. xxx. A few specimens from deep water, west of May Island (S.F.B.).

Cythere antiquata (Baird).

Cythere antiquata, Brady, *op. cit.*, p. 417, pl. xxx. Gulland Bay and vicinity of Inchkeith ; not common (S.F.B.).

Cythere Jonesii (Baird).

Cythere Jonesii, Brady, *op. cit.*, p. 418, pl. xxx. Occasionally in dredged material from Gulland Bay and deep water west of May Island (S.F.B.).

Cythere cyamos, Norman.

Cythere viridis, Brady, (*non* Müller), *op. cit.*, p. 397, pls. xxviii. xxxviii.

Cythere cyamos, Norman, Mus. Nor., part iii. p. 21, 1886. Gulland Bay ; rather frequent (S.F.B.).

Cytheridea papillosa, Bosquet.

Cytheridea papillosa, Brady, *op. cit.*, p. 423, pls. xxviii., xl. Gulland Bay, 10 to 12 fathoms ; off North Berwick, frequent. This species sometimes occurs in considerable abundance (S.F.B.).

Cytheridea elongata, Brady.

Cytheridea elongata, Brady, *op. cit.*, p. 421, pls. xxviii., xl. A few from deep water, west of Inchkeith (S.F.B.).

Eucythere declivis (Norman).*Eucythere declivis*, Brady, *op. cit.*, p. 430, pl. xxvii.*Eucythere argus*, G. O. Sars (var.), Mus. Nor., part iii.*Eucythere anglica*, Brady (var). A few from same locality as last (S.F.B.).*Loxoconcha guttata* (Norman).*Loxoconcha guttata*, Brady, *op. cit.*, p. 436, pl. xxvii. Gulland Bay, 10 to 12 fathoms; off North Berwick; frequent (S.F.B.).*Loxoconcha tamarindus* (Jones).*Loxoconcha tamarindus*, Brady, *op. cit.*, p. 435, pl. xxv. Vicinity of Inchkeith, Gulland Bay, off North Berwick; frequent (S.F.B.).*Xestoleberis depressa*, G. O. Sars.*Xestoleberis depressa*, Brady, *op. cit.*, p. 438, pl. xxvii. One or two among material dredged a little west of Inchkeith (S.F.B.).*Cytherura striata*, G. O. Sars.*Cytherura striata*, Brady, *op. cit.*, p. 441, pl. xxxii.*Cytherura quadrata* (fem.), Norman, Mus. Nor., p. iii. Gulland Bay, both forms; not unfrequent (S.F.B.).*Cytherura nigrescens* (Baird).*Cytherura nigrescens*, Brady, *op. cit.*, p. 440, pls. xxxii., xxxix. Gulland Bay; common (S.F.B.).*Cytherura acuticostata*, G. O. Sars.*Cytherura acuticostata*, Brady, *op. cit.*, p. 445, pl. xxxii. Among material dredged a little west of Inchkeith (S.F.B.).*Cytherura angulata*, Brady.*Cytherura angulata*, Brady, *op. cit.*, p. 440, pl. xxxii.*Cytherura insolita*, Brady, Norman, Mus. Nor., pt. iii. Among material dredged west of Inchkeith (S.F.B.).*Cytherura cuneata*, Brady.*Cytherura cuneata*, Brady, *op. cit.*, p. 442, pl. xxxii.*Cytherura flavescens*, Brady (fem.), Norman, Mus. Nor., pt. iii. Gulland Bay; frequent (S.F.B.).*Cytherura undata*, G. O. Sars.*Cytherura undata*, Brady, *op. cit.*, p. 443, pl. xxxii. Among material dredged west of Inchkeith (S.F.B.).*Cytherura clathrata*, G. O. Sars.*Cytherura clathrata*, Brady, *op. cit.*, p. 446, pl. xxix. Among material dredged off Bo'ness and a little west of Inchkeith; not very common (S.F.B.).*Cytherura cellulosa* (Norman).*Cytherura cellulosa*, Brady, *op. cit.*, p. 446, pl. xxix. Gulland Bay; not very common (S.F.B.).*Cytheropteron nodosum*, Brady.*Cytheropteron nodosum*, Brady, *op. cit.*, p. 448, pl. xxxiv. Gulland Bay; not unfrequent (S.F.B.).*Cytheropteron latissimum* (Norman).*Cytheropteron latissimum*, Brady, *op. cit.*, p. 448, pl. xxxiv. Gulland Bay, and in deep water west of May Island; frequent (S.F.B.).*Bythocythere simplex* (Norman).*Bythocythere simplex*, Brady, *op. cit.*, p. 450, pls. xxxiii., xl. Occasionally in the same localities as last (S.F.B.).

Cytherideis subulata, Brady.

Cytherideis subulata, Brady, *op. cit.*, p. 454, pl. xxxv. A few specimens, among material dredged a little west of Inchkeith (S.F.B.).

Sclerochilus contortus, Norman.

Sclerochilus contortus, Brady, *op. cit.*, p. 455, pls. xxxiv., xli. Gulland Bay, and in deep water (26 to 28 fathoms) west of May Island; frequent (S.F.B.).

Xiphichilus tenuissimus, Norman.

Xiphichilus tenuissimus, Norman, Mus. Nor., pt. iii., p. 21. In deep water west of May Island; not common (S.F.B.).

Paradoxostoma abbreviatum, G. O. Sars.

Paradoxostoma abbreviatum, Brady, *op. cit.*, p. 458, pl. xxxv. Gulland Bay; a few specimens (S.F.B.).

Paradoxostoma ensiforme, Brady.

Paradoxostoma ensiforme, Brady, *op. cit.*, p. 460, pl. xxxv. Among material dredged a little west of Inchkeith (S.F.B.).

Paradoxostoma flexuosum, Brady.

Paradoxostoma flexuosum, Brady, *op. cit.*, p. 461, pl. xxxv. Gulland Bay; among material dredged off Bo'ness; frequent (S.F.B.).

CYPRIDINIDÆ.

Philomedes interpuncta (Baird).

Philomedes interpuncta, Brady, *op. cit.*, p. 463, pl. xxxiii. Occasionally among dredged material, Gulland Bay, west of Inchkeith, &c., but seldom in material taken with surface-net (S.F.B.).

Remarks.—The Ostracoda are not so important as the Copepoda as a source of food for fishes. Only in a very few instances have I noticed them among the contents of fishes' stomachs, and these were the stomachs of ground feeders, such as haddock and cod, and the only species of Ostracod observed was the one last recorded in the preceding list, viz., *Philomedes interpuncta*. The young of *Balanus* in an early stage (the Ostracod stage) are frequently found in the stomachs of herring and other fishes, and are liable to be mistaken for a species of Ostracod, which may account for such Entomostracans being recorded as occurring in the contents of fishes' stomachs more often than is really the case. Most of the species live on or in the mud at the bottom, or among the Algæ and Zoophytes which grow there within certain limits.

A small Entomostracan, *Evadne Nordmannii*, Loven, is frequently noticed among the material collected by the surface-net in the seaward part of the Forth, but not in so great abundance as it occurs in the Firth of Clyde, the stomachs of herring taken there being sometimes found to contain considerable numbers of these organisms. Whether the herring purposely seek for and capture them, or whether they are swallowed in a sort of indiscriminate way, as suggested by Dr Mobius, has not been satisfactorily ascertained.

AMPHIPODA.*

ORCHESTIIDÆ.

Talitrus locusta, Linn. (Pallas?).

Talitrus locusta, Bate and Westwood, Brit. Sess.-eyed Crust., vol. i. p. 16, 1863. 'Very abundant about high-tide mark, frequent among stones, sea-weed, &c.' (L. & H.).

* The arrangement and nomenclature of Part iii. of Museum Normanianum are followed here.

Orchestia gammarellus, Pallas.*Orchestia gammarellus*, Norman, Mus. Nor., p. iii. p. 13, 1886.*Orchestia littorea*, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 27, 1863. Common among decaying sea-weed about high-water mark, west of Granton.*Hyale nilssoni* (Rathke).*Hyale nilssoni*, Norman, Mus. Nor., pt. iii. p. 14, 1886.*Allorchestes Nilssoni*, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 40, 1863. Granton Quarry, common; May Island, near high water' (Henderson). Surface-net, Society Bank, west of Queensferry, one specimen (S.F.B.).

GAMMARIDÆ.

Orchomene serrata, Boeck.*Orchomene serrata*, Norman, Mus. Nor., pt. iii. p. 14, 1886.*Anonyx Edwardsii*, B. & W. (*non* Kröyer), Brit. Sess.-eyed Crust., vol. i. p. 94.

Between tide-marks, near Joppa, one or two specimens (S.F.B.).

Bathyporeia pilosa, Lindstrom.*Bathyporeia pilosa*, Norman, Mus. Nor., pt. iii. p. 14, 1886.*Bathyporeia pilosa*, *pelagica*, and *Robertsoni*, B. & W., Brit. Sess.-eyed Crust., vol. i. pp. 304-7-9. Near low-water mark, west of Granton; one or two specimens (S.F.B.).*Harpina plumosa* (Kröyer).*Harpina plumosa*, Norman, Mus. Nor., pt. iii. p. 14, 1886.*Phoxus plumosus*, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 146. Gulland Bay, and in deep water west of May Island (S.F.B.).*Amphilochus manudens*, Bate.*Amphilochus manudens*, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 179. Gulland Bay, one or two specimens (S.F.B.).*Stenothoe monoculoides* (Mont.).*Stenothoe monoculoides*, Norman, Mus. Nor., pt. iii. p. 14, 1886.*Montagui monoculoides*, Mont., B. & W., Brit. Sess.-eyed Crust., vol. i. p. 54. Granton Harbour, taken with surface-net; not common (S.F.B.).*Metopa pollexiana* (Bate).*Metopa pollexiana*, Norman, Mus. Nor., pt. iii. p. 14, 1886.*Montagui pollexiana*, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 64.*Stenothoe pollexiana*, Henderson, Proc. Roy. Phys. Soc. Edin., vol. viii. p. 310, 1884. Newhaven, from fishermen's lines (Henderson); off Inchkeith, west side; common (S.F.B.).*Monoculodes longimanus*, B. & W.*Monoculodes longimanus*, B. & W., Brit. Sess.-eyed Crust., vol. ii. p. 507. One or two specimens among material dredged off Bo'ness (S.F.B.).*Pontocrates altimarinus* (B. & W.).*Pontocrates altimarinus*, Norman, Mus. Nor., pt. iii. p. 15, 1886.*Kroyera altimarinus*, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 177. In the same material as the last (S.F.B.).*Paramphithoe bicuspis* (Kröyer).*Paramphithoe bicuspis*, Norman, Mus. Nor., pt. iii. p. 15, 1886.*Pherusa bicuspis*, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 253. Newhaven, from fishermen's lines (Henderson).

Paramphithoe fucicola (Leach).

Paramphithoe fucicola, Norman, Mus. Nor., pt. iii. p. 15, 1886.

Pherusa fucicola, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 255, 1863. Newhaven, from fishermen's lines (Henderson).

Iphimedia obesa, Rathke.

Iphimedia obesa, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 219, 1863. Newhaven, from fishermen's lines, many specimens; dredged to east of Inchkeith (Henderson); Granton Harbour, among Zoophytes attached to pier; sometimes taken with surface-net (S.F.B.).

Dexamine spinosa (Mont) (Leach?, L. & H.).

Dexamine spinosa, Mont., B. & W., Brit. Sess.-eyed Crust., vol. i. p. 237, 1863. Low water, Prestonpans (Cunningham, L. & H.). Gulland Bay; a few specimens (S.F.B.).

Atylus Swammerdamii (Milne-Edwards).

Atylus Swammerdamii, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 246, 1863. Gulland Bay; about a dozen specimens (S.F.B.).

Halirages bispinosus (Bate).

Halirages bispinosus, Norman, Mus. Nor., pt. iii. p. 15, 1886.

Atylus bispinosus, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 250, 1863. Gulland Bay; scarce (S.F.B.).

Calliopius læviusculus (Krøyer).

Calliopius læviusculus, Norman, Mus. Nor., pt. iii. p. 15, 1886.

Calliope læviuscula, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 254, 1863. Not unfrequent between tide-marks near Joppa (S.F.B.).

Calliopius bidentatus, Norman.

Calliopius bidentatus, Henderson, Proc. Roy. Phys. Soc. Edin., vol. viii. p. 310, 1884. Newhaven, many specimens from fishermen's lines; dredged off Fidra, 12 fathoms (Henderson).

Melita obtusata (Mont).

Melita obtusata, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 341, 1863. Bass Rock, 24 fathoms; off St Abb's Head, 40 fathoms (Metzger; L. & H.). Aberlady Bay (S.F.B.).

Melita proxima, Bate, and *Megamaera Alderi*, Bate, are forms of this species (Norman, Mus. Nor., pt. iii. p.).

Melita gladiosa, Bate.

Melita gladiosa, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 346, 1863. Largo Bay; two specimens (S.F.B.).

Mæra grossimana, Mont.

Mæra grossimana, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 350, 1863. One specimen, among material dredged a little west of Inchkeith (11-11-87) (S.F.B.). This is an interesting addition to the fauna of the Forth. Bate and Westwood say: 'It would appear from the circumstance of its being 'very abundant on the south of England, whilst we have never 'received it from our numerous correspondents from the north ' (although it is recorded by Dr Johnston at Berwick, see Zool. 'Journ., iii. 180, where he records it as not very rare in 'Berwick Bay), to be essentially a species belonging to warmer 'latitudes.'

Mæra othonis (Milne-Edward).

Mæra othonis, Norman, Mus. Nor., pt. iii. p. 16, 1886.

Megamaera othonis, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 405, 1863. Gulland Bay; one specimen (S.F.B.).

Gammarus locusta (Linné).

Gammarus locusta, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 378, 1863. Common among decaying sea-weed near high-water mark ; occasionally in the surface-net (S.F.B.).

Byblis Gaimardi, Kröyer.

Byblis Gaimardi, L. & H., Invert. fauna Firth of Forth, p. 105, 1881. St Abb's Head, 40 fathoms (Metzger ; L. & H.).

Ampelisca typica (Bate).

Ampelisca typica, Norman, Mus. Nor., pt. iii. p. 16, 1886.

Ampelisca Gaimardi, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 127, 1863. East of Fidra (S.F.B.).

Ampelisca tenuicornis, Lilljeborg.

Ampelisca tenuicornis, Norman, Mus. Nor., pt. iii. p. 16, 1886.

Ampelisca lævigata, B. & W., Brit. Sess.-eyed Crust., vol. ii. p. 504, 1863. Bass Rock, 24 fathoms ; off St Abb's Head, 40 fathoms (Metzger ; L. & H.) ; Gulland Bay (S.F.B.).

Ampelisca macrocephala, Lilljeborg.

Ampelisca macrocephala, L. & H. Invert. fauna Firth of Forth, p. 44, 1881. Firth of Forth, 24 fathoms (Metzger ; L. & H.).

Ampelisca æquicornis, Bruzelius.

Ampelisca æquicornis, Henderson, Proc. Roy. Phys. Soc. Edin., vol. viii. p. 310, 1884. West of May Island, 20 fathoms (Henderson).

Ptilocheirus hirsutimanus (Bate).

Ptilocheirus hirsutimanus, Norman, Mus. Nor., pt. iii. p. 16, 1886,

Protomedia hirsutimana, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 298, 1863. East off Elie Ness, 15-17 fathoms (S.F.B.).

Aora gracilis, Bate.

Aora gracilis, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 281, 1863. Newhaven, many specimens from fishermen's lines, both sexes, off Fidra (Henderson) ; Gulland Bay, and deep water west of May Island (S.F.B.).

Protomedia fasciata, Kröyer.

Protomedia fasciata, L. & H., Invert. fauna Firth of Forth, p. 44, 1881. St Abb's Head, 40 fathoms (Metzger ; L. and H.).

Gammaropsis erythrophthalmus (Lilljeborg).

Gammaropsis erythrophthalmus, Norman, Mus. Nor., pt. iii. p. 17, 1886.

Eurystheus erythrophthalmus, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 354, 1863. One or two specimens, dredged a little west of Inchkeith.

COROPHIIDÆ.

Podoceropsis Sophia (Boeck).

Podoceropsis Sophia, Norman, Mus. Nor., pt. iii. p. 17, 1886.

Nænia tuberculosa, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 472, 1863. Dredged to the east of Inchmickery ; also south-west of Inchkeith (Henderson). Gulland Bay (S.F.B.).

Podoceropsis rimapalma (Bate).

Podoceropsis rimapalma, Norman, Mus. Nor., pt. iii. p. 17, 1886.

Nænia rimapalma, *excavata*, and *undata*, B. & W. Brit. Sess.-eyed Crust., vol. i. pp. 472 4 6, 1863. With the last in both localities (Henderson). Largo Bay, 10 to 12 fathoms (S.F.B.).

Amphithoe podoceroïdes (Rathke).

Amphithoe podoceroïdes, Norman, Mus. Nor., pt. iii. pt. 17, 1886

- Amphithoe littorina*, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 422, 1863. Gulland Bay, and deep water west of May Island (S.F.B.).
- Erichthonius difformis*, Milne-Edwards.
- Erichthonius difformis*, Norman, Mus. Nor., pt. iii. p. 17, 1886.
- Cerapus difformis*, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 457, 1863.
- Dercothoe punctatus* (fem.), *loc. cit.*, p. 461. Gulland Bay (S.F.B.). Bass Rock (Metzger ; L. & H.).
- Erichthonius abditus* (Templeton).
- Erichthonius abditus*, Norman, Mus. Nor., pt. iii. p. 17, 1886.
- Cerapus abditus*, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 455, 1863. Gulland Bay ; a few specimens (S.F.B.).
- Sunamphithoe hamulus*, Bate.
- Sunamphithoe hamatus*, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 430, 1863. Off Pittenweem, among trawl refuse, and between tide-marks near Portobello (S.F.B.).
- Podocerus falcatus* (Mont).
- Podocerus falcatus*, Norman, Mus. Nor., pt. iii. p. 17, 1886.
- Podocerus* (*Jassa*) *pelagicus*, B. & W., Brit. Sess.-eyed Crust., vol. i. pp. 436, 445, 447.
- Podocerus* (*Jassa*) *pulchellus*, B. & W., *loc. cit.* Gulland Bay ; a few specimens (S.F.B.).
- Janassa capillata* (Rathke).
- Janassa capillata*, Norman, Mus. Nor., pt. iii. p. 17, 1886.
- Podocerus capillatus*, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 442, 1863. 'We have dredged this species in 5 fathoms 'off Inchkeith' (L. & H.).
- Dryope crenatipalmata*, Bate.
- Dryope crenatipalmata*, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 490, 1863. Among material dredged off Bo'ness (S.F.B.).
- Corophium grossipes* (Linné).
- Corophium grossipes*, Norman, Mus. Nor., pt. iii. p. 17, 1886.
- Corophium longicorne*, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 493, 1863. Dunbar (Robertson ; L. & H.).
- Corophium crassicorne*, Bruzelius.
- Corophium crassicorne*, Norman, Mus. Nor., pt. iii. p. 17, 1886.
- Corophium spinicorne*, B. & W., Brit. Sess.-eyed Crust., vol. i. pp. 497-9.
- Corophium Bonellii*, B. & W., *loc. cit.* Gulland Bay ; several specimens (S.F.B.).
- Corophium tenuicorne*, Norman.
- Corophium tenuicorne*, Henderson, Proc. Roy. Phys. Soc. Edin., vol. viii. p. 310, 1884. A single species dredged off Fidra in 12 fathoms (Henderson).

HYPERIIDÆ.

- Hyperia medusarum* (O. Fabricius).
- Hyperia medusarum*, Norman, Mus. Nor., pt. iii. p. 13, 1863.
- Hyperia galba*, B. & W., Brit. Sess.-eyed Crust., vol. ii. p. 12, 1863.
- Lestrigonus Kinahani*, B. & W., *loc. cit.*, p. 8. In the pouches of Medusæ (Cunningham ; L. & W.). Occasionally in the surface-net (S.F.B.).

Parathemisto oblivia (Kröyer).*Parathemisto oblivia*, Norman, Mus. Nor., pt. iii. p. 13, 1886.*Hyperia oblivia*, B. & W., Brit. Sess.-eyed Crust., vol. ii. p. 16, 1863. Several specimens taken in the tow-net off May Island and off Inchkeith; occasionally in surface-net, Largo Bay, off North Berwick; surface-net, Society bank, west of Queensferry; one specimen (S.F.B.).

DULICHIIDÆ.

Dulichia falcata, Bate.*Dulichia falcata*, B. & W., Brit. Sess.-eyed Crust., vol. ii. p. 33, 1863. One specimen in surface-net in Granton Harbour (S.F.B.).

CAPRELLIDÆ.

Proto ventricosa (Müller).*Proto ventricosa*, Norman, Mus. Nor., pt. iii. p. 17, 1886.*Proto pedata*, B. & W., Brit. Sess.-eyed Crust., vol. ii. pp. 38, 42.*Proto Goodsiri*, B. & W., *loc. cit.* Newhaven, from the fishermen's lines; not uncommon (Henderson). Gulland Bay (S.F.B.).*Protella phasma*, Mont.*Protella phasma*, B. & W., Brit. Sess.-eyed Crust., vol. ii. p. 45, 1863. Island of May (Brit. Mus.); Firth of Forth (H.D.S. Goodsir; L. & H.). Two or three specimens, Gulland Bay, (S.F.B.).*Caprella linearis* (Linné).*Caprella linearis*, Norman, Mus. Nor., pt. iii. p. 17, 1886.*Caprella linearis*, B. & W., Brit. Sess.-eyed Crust., vol. ii. pp. 52-57, 1863.*Caprella lobata*, B. & W., *loc. cit.* Plentiful in the upper laminarian zone; we have also dredged it in a few fathoms (L. & H.). Gulland Bay; frequent (S.F.B.).*Caprella acanthifera*, Leach.*Caprella acanthifera*, B. & W., Brit. Sess.-eyed Crust., vol. ii. p. 65, 1863. Firth of Forth (Bell Collection, Oxford, Rev. J. Gordon; L. & H.).*Caprella tuberculata*, Guérin.*Caprella tuberculata*, B. & W., Brit. Sess.-eyed Crust., vol. ii. p. 68, 1863. Firth of Forth (Brit. Mus.; L. & H.). Gulland Bay (S.F.B.).*Podalirius typicus*, Kröyer.*Podalirius typicus*, Norman, Mus. Nor., pt. iii. p. 17, 1886.*Caprella typica*, B. & W., Brit. Sess.-eyed Crust., vol. ii. p. 35, 1863. Firth of Forth (Bell Collection, Oxford; L. & H.). In about 12 fathoms, east of Inchkeith and Largo Bay (S.F.B.).

Remarks.—It will be observed that by the investigations carried out by instructions of the Fishery Board, several species of Amphipods are here recorded for the first time from the estuary of the Forth, and doubtless others will be discovered as these investigations are proceeded with. Amphipods are frequently met with in the stomachs of fishes, but so far as has been observed, those fishes which feed mostly near the

bottom, such as haddock and cod, appear to have no partiality for any particular species, but the stomachs of herring, especially of those taken on the East Coast, are found occasionally filled with species of Hyperiidæ to the exclusion of everything else, *Hyperia galba* and *Parathemisto obliqua* being the two generally observed. Of course the Hyperiidæ are exclusively pelagic in their habits, which may partly account for this, but the young and half-grown specimens of other species which are frequently met with in material collected with the surface-net have very seldom been noticed in herrings' stomachs, so that it is probable the species of Hyperiidæ are preferred by them.

ISOPODA.

The arrangement followed here is that adopted in Bate and Westwood's *Monograph of British Sessile-eyed Crustacea*; the nomenclature that of Part iii. of *Museum Normanianum*.

TANAIDÆ.

Tanais vittatus (Rathke).

Tanais vittatus, B. & W., Brit. Sess.-eyed Crust., vol. ii. p. 125 1863. May Island and Dunbar; about half-tide, living chiefly among mussels (Henderson).

Pseudotanaïs forcipatus (Lilljeborg).

Pseudotanaïs forcipatus, Norman, Mus. Nor., pt. iii. p. 11, 1886.

Paratanaïs forcipatus, B. & W., Brit. Sess.-eyed Crust., vol. ii. p. 138, 1863. Gulland Bay, frequent among dredged material; and from deep water west off Inchkeith (S.F.B.).

BOPYRIDÆ.

Phryxus abdominalis (Kröyer).

Phryxus abdominalis, B. & W., Brit. Sess.-eyed Crust., vol. ii. p. 234, 1863. Off St Abb's Head, 40 fathoms (Metzger; L. & H.).

Athelges paguri (Rathke).

Athelges paguri, Norman, Mus. Nor., pt. iii. p. 13, 1886.

Phryxus paguri, B. & W., Brit. Sess.-eyed Crust., 1863. Firth of Forth (Dr Anderson).* On *Pagurus Bernhardus*, dredged in Gulland Bay (S.F.B.).

Liriopsis balani, Bate.

Liriopsis balani, Bate, Brit. Assoc. Report, 1860, p. 225.

Cryptothiria balani, Bate, B. & W., Brit. Sess.-eyed Crust., vol. ii. p. 267, 1863. Firth of Forth (H. Goodsir, as male of *Balanus balanoides*, in *Edin. New Phil. Journ.*, 1843; B. & W.).

ÆGIDÆ.

Eurydice pulchra, Leach.

Eurydice pulchra, B. & W., Brit. Sess.-eyed Crust., vol. ii. p. 310, 1863. Taken in surface-net, off Preston Island, a few miles west of Queensferry; one specimen (28.11.87, S.F.B.).

ASELLIDÆ.

Jæra albifrons (Mont).

Jæra albifrons, B. & W., Brit. Sess.-eyed Crust., vol. ii. p. 317, 1863. Common at the May Island and Granton Quarry (Henderson).

* *Proc. Roy. Phys. Soc. Edin.*, vol. vii.

Jæra Nordmanni (Rathke).

Jæra Nordmanni, B. & W., Brit. Sess.-eyed Crust., vol. ii. p. 320, 1863. Among dredged material, off Inchkeith. Between tide-marks near Joppa (S.F.B.).

Munna Kröyeri, Goodsir.

Munna Kröyeri, Goodsir, Edin. New Phil. Journ., 1842.

Munna Kröyeri, B. & W., Brit. Sess.-eyed Crust., vol. ii. p. 326, 1863. Firth of Forth (Goodsir). Among material dredged a little west of Inchkeith; several specimens (S.F.B.).

Janira maculosa, Leach.

Janira maculosa, B. & W., Brit. Sess.-eyed Crust., vol. ii. p. 338, 1863. Among dredged materials off Bo'ness (S.F.B.).

Limnoria lignorum (Rathke).

Limnoria lignorum, B. & W., Brit. Sess.-eyed Crust., vol. ii. p. 351, 1863. 'We obtained it at Elie' (L. & H.).

ARCTURIDÆ.

Astacilla longicornis (Sowerby).

Astacilla longicornis, Norman, Mus. Nor., pt. iii. p. 12, 1886.

Arcturus longicornis, B. & W., Brit. Sess.-eyed Crust., vol. ii. p. 365, 1863. Firth of Forth; not unfrequent throughout the estuary.

Astacilla intermedia (Goodsir).

Leachia intermedia, Goodsir, Edin. New Phil. Journ., 1842.

Astacilla intermedia, Norman, Mus. Nor., pt. iii. p. 12, 1886.

Arcturus intermedia, B. & W., Brit. Sess.-eyed Crust., vol. ii. p. 371, 1863. Off Anstruther (Goodsir).

Astacilla gracilis (Goodsir).

Leachia gracilis, Goodsir, Edin. New Phil. Journ., 1842.

Astacilla gracilis, Norman, Mus. Nor., pt. iii. p. 12, 1886.

Arcturus gracilis, B. & W., Brit. Sess.-eyed Crust., vol. ii. p. 373, 1863. Off Anstruther (Goodsir).

IDOTEIDÆ

Idotea marina, Linné. (Fabr.?).

Idotea marina, Norman, Mus. Nor., pt. iii. p. 12, 1886.

Idotea tricuspidata, B. & W., Brit. Sess.-eyed Crust., vol. ii. pp. 379, 384, 1863.

Idotea pelagica, B. & W., *loc. cit.* Common throughout the Forth.

Idotea linearis (Linné) (Penn.?).

Idotea linearis, B. & W., Brit. Sess.-eyed Crust., vol. ii. p. 388, 1863. Occasionally at Newhaven, from the fishermen's lines (Henderson). Off Crail; several specimens (S.F.B.).

Idotea emarginata (Fabricius).

Idotea emarginata, B. & W., Brit. Sess.-eyed Crust., vol. ii. p. 386, 1863. Several specimens taken with the dredge in Aberlady Bay.

ONISCIDÆ.

Ligia oceanica (Linné).

Ligia oceanica, B. & W., Brit. Sess.-eyed Crust., vol. ii. p. 444, 1863. Under stones at and above high-water mark; generally distributed.

Remarks.—Isopods, especially the commoner Idoteidæ, are frequently found among the contents of the stomachs of fishes such as cod, haddock, saith, and other ground-feeders, but seldom in the stomachs of pelagic fishes.

CUMACEA.*

DIASTYLIDÆ.

Iphinoe gracilis, Bate.

Iphinoe gracilis, L. & H., Invert. Fauna Firth of Forth, p. 106.

Venilia gracilis, White, Pop. Hist. Brit. Crust., p. 153, 1857.

Bass Rock, 24 fathoms (Metzger; L. & H.).

Cumopsis Goodsiri, Van Beneden.

Between tide-marks near Joppa (S.F.B.).

Lamprops fasciata, G. O. Sars.

Frequent between tide-marks near Joppa, where the beach is composed of sand; also taken with surface-net in Granton Harbour (S.F.B.).

Leucon nassica, Kröyer.

Leucon nassica, L. & H., Invert. Fauna Firth of Forth, p. 106, 1881. St Abb's Head, 40 fathoms (Metzger; L. & H.).

Diastylis Rathkii, Kröyer.

Alauna rostrata, Bell, Brit. Stalk-eyed Crust., p. 331, 1853.

Diastylis Rathkii, Sp. Bate, Ann. and Mag. Nat. Hist., vol. xvii. p. 451, 1856.

Diastylis Rathkii, White's Pop. Hist. Brit. Crust., p. 150, 1857. Firth of Forth (Goodsir; L. & H.). A considerable number of specimens among material dredged a little west of Inchkeith (S.F.B.).

Diastylis lucifera, Kröyer.

One specimen among material dredged off the west side of Inchkeith (S.F.B.).

Diastylis lævis, Norman.

Off Fidra, 12 fathoms (Henderson).

Pseudocuma cercaria, Van Beneden.

Several specimens between tide-marks near Joppa; taken with surface-net in Granton Harbour; also taken with surface-net, inshore, near Charleston (S.F.B.).

(?) *Cuma Edwardsii*, Goodsir.

Cuma Edwardsii, White, Pop. Hist. Brit. Crust., p. 151, 1857. Firth of Forth (H. Goodsir). Largo Bay (L. & H.).

Cuma scorpioides, Mont.

Cuma scorpioides, White, Pop. Hist. Brit. Crust., p. 150, 1857. Firth of Forth (H. Goodsir; L. & H.).

(?) *Cuma trispinosa*, Goodsir.

Cuma trispinosa, Bell, Brit. Stalk-eyed Crust., p. 329, 1853.

Halia trispinosa, White, Pop. Hist. Brit. Crust., p. 152, 1857.

Halia trispinosa, Bate, Ann. and Mag. Nat. Hist., vol. xvii. p. 459, 1856. Firth of Forth (H. Goodsir; L. & H.).

(?) *Bodotria arenosa*, Goodsir.

Bodotria arenosa, Bell, Brit. Stalk-eyed Crust., p. 332, 1853. Firth of Forth (H. Goodsir; L. & H.).

Remarks.—Some of Goodsir's *Cumas* cannot satisfactorily be ascribed to known species. Four of the Cumacea here recorded are additions to the Forth fauna.

* The arrangement followed here and in the list of the Schizopoda is that of part ii. of Museum Normandanum.

SCHIZOPODA.

EUPHAUSIDÆ.

Boreophausia raschii (M. Sars).

Thysanopoda Raschii, M. Sars, Vidensk. Selsk. Förhandl., 1863, p. 14.

Boreophausia Raschii, G. O. Sars, Prelim. Notices Challenger Schizopoda, Vidensk. Selsk. Förhandl., No. 7, p. 11, 1883. 'We took specimens in the Firth of Forth in November 1884.' (Henderson).

Nyctiphanes norvegica (M. Sars).

Thysanopoda norvegica, M. Sars, Vidensk. Selsk. Förhandl., 1863, p. 2.

Nyctophanes norvegica, G. O. Sars, Prelim. Notices Challenger Schizopoda, 1883, No. 7, p. 23. Many specimens taken in the surface-net north-east of Inchkeith (Henderson). This species is of frequent occurrence in the Firth of Forth (S.F.B.).

MYSIDÆ.

Mysidopsis gibbosa, G. O. Sars.

Mysidopsis gibbosa, G. O. Sars, Carcinologisk Bidrag til Norges Fauna I. Monogr. over de ved Norges kyster forekommende Mysider Hefte ii. p. 23, pl. xxviii. figs. 1-13, 1872. One specimen taken with surface-net in Granton Harbour, November 1887 (S.F.B.).

Leptomysis lingvura, G. O. Sars.

Leptomysis lingvura, G. O. Sars, *op. cit.*, Hefte. iii. p. 35, pl. xxi., 1879. Several specimens were secured near extreme low-water mark, a little east of Joppa, September 1887 (S.F.B.).

Siriella crassipes, G. O. Sars.

Siriella crassipes, G. O. Sars. One specimen taken at extreme low water, a little east of Joppa, September 1887 (S.F.B.).

Gastrosaccus spinifer, Göes.

Gastrosaccus spinifer, Stebbing, Ann. and Mag. Nat. Hist., ser. 5 vol. vi., 1880. Frequent in material collected in surface-net off Bo'ness.

Macropsis slabberi, Van Beneden.

Macropsis slabberi, Henderson, Decapod and Schizopod. Crust. Clyde, p. 11, 1886.

Podopsis slabberi, Henderson, Proc. Roy. Phys. Soc. Edin., vol. viii. p. 311, 1884. Taken by Mr Cunninghame and Dr Henderson with surface-net, below Grangemouth, in October 1884, and subsequently near Granton Quarry, Inchmickery, and Inchkeith (Henderson). Off Bo'ness, a very common species in the upper waters of the Forth, but does not yet appear to have been met with anywhere else in Britain (S.F.B.).

Mysis flexuosa, Müller.

Mysis flexuosus, G. O. Sars, *op. cit.*, Hefte iii. p. 45, pls. xxiv, xxv., 1879.

Mysis chamæleon, Bell, Brit. Stalk-eyed Crust., p. 336, 1853. Rock pools, Seafeld (M'B.); Firth of Forth (Leach; L. and H.). West of Granton at low water; frequent, and in pools left by the ebbing tide (S.F.B.).

[Exceedingly plentiful in Cromarty Firth, near Invergordon, September 1887 (S.F.B.).]

Mysis inermis, Rathke.

Mysis inermis, G. O. Sars, *op. cit.*, Hefte iii. p. 54, pl. xxvii., 1879. Taken by surface-net off Bo'ness, November 1887 (S.F.B.).

Mysis spiritus, Norman.

Mysis spiritus, G. O. Sars, *op. cit.*, Hefte iii. p. 58, pl. xxviii., 1879. Taken in the same locality as the last; several specimens (S.F.B.).

[Also taken by tow-net at 14 fathoms near Aberdeen, October 1886 (S.F.B.).]

Mysis ornata, G. O. Sars.

Mysis ornata, G. O. Sars, *op. cit.*, Hefte iii. p. 62, pl. xxix., 1879. Taken with the last two (S.F.B.).

Mysis lamornæ, R. Q. Couch.

Mysis lamornæ, White, Pop. Hist. Brit. Crust., p. 143, 1857.

Mysis aurantia, G. O. Sars, Beretning om en i Sommeren, 1863, foretagen Zoologisk Reise, p. 30. Also taken in surface-net off Bo'ness; two or three specimens (S.F.B.).

Mysis vulgaris, J. Vaughan Thompson.

Mysis vulgaris, Bell, Brit. Stalk-eyed Crust., p. 339, 1853. A common species in surface-net, material in various parts of the Forth west of Queensferry, and occasionally in Granton Harbour (S.F.B.).

Remarks.—With the exception of the last, the species of *Mysis* recorded here have the telson more or less bifurcate, but the telson of *Mysis vulgaris* terminates in a blunt point, and the antennal scales also differ from those of the other species of the genus. *Cynthia flemingii* (Goodsir), *Themisto longispinosa* (Goodsir), and *Themisto brevispinosa* (Goodsir), recorded from the Firth of Forth by Mr H. Goodsir, are doubtful species. Dr. Norman says that it is impossible to identify Goodsir's Mysidæ, but suggests that his *Cynthia flemingii* may be the *Siriella crassipes* of G. O. Sars, and *Themisto longispinosa* and *Themisto brevispinosa* the males of species of *Mysis*.

Through the investigations carried on by the Fishery Board, nine species of Schizopoda have been added to the fauna of the Firth of Forth. It may be worth noting that though a considerable number of species of Schizopods are now included in the British fauna, only two (*Nyctiphanes norvegica* and *Boreophausia raschii*) have been observed among the contents of fishes' stomachs, *e.g.*, those of the herring and mackerel.

DECAPODA.

BRACHYURA.

INACHIDÆ.

Inachus dorsettensis (Pennant).

Inachus dorsettensis, Bell, Brit. Stalk-eyed Crust., p. 13, 1853, 'Deep sea lines' (Howden; L. & H.).

MAIIDÆ.

Hyas araneus (Linné).

Hyas araneus, Bell, Brit. Stalk-eyed Crust., p. 31, 1853. Common between tide-marks, and dredged in all parts of the estuary. Fishermen have a great dislike to this crab, and

generally kill every one they get; it is blamed for eating the bait from the hooks of the long lines, to the great annoyance and loss of the fishermen.

Hyas coarctatus Leach.

Hyas coarctatus, Bell, Brit. Stalk-eyed Crust., p. 35, 1853. A fairly common species, from the laminarian zone outwards.

LEPTOPODIDÆ.

Stenorhynchus rostratus, Linné.

Stenorhynchus rostratus, Norman, Mus. Nor., pt. iii. p. 6, 1886.

Stenorhynchus phalangium, Bell, Brit. Stalk-eyed Crust., p. 2, 1853. Firth of Forth, on mud and sand, generally distributed (Howden; L. & H.); common in the vicinity of Inchkeith (S.F.B.).

PARTHENOPIDÆ.

Eurynome aspera (Pennant).

Eurynome aspera, Bell, Brit. Stalk-eyed Crust., p. 46, 1853. Off Prestonpans and Portseaton (Howden; L. & H.).

CANCRIDÆ.

Cancer pagurus, Linné.

Cancer pagurus, Bell, Brit. Stalk-eyed Crust., p. 59, 1853. Common in the laminarian and littoral zones (L. & H.). Occasionally in the trawl-net (S.F.B.).

PORTUNIDÆ.

Portunus puber (Linné).

Portunus puber, Bell, Brit. Stalk-eyed Crust., p. 90, 1853. One specimen on the deep-sea lines, from the mouth of the Forth (L. & H.).

Portunus depurator (Linné).

Portunus depurator, Bell, Brit. Stalk-eyed Crust., p. 101, 1853. A common species throughout the estuary.

Portunus marmoreus, Leach.

Portunus marmoreus, Bell, Brit. Stalk-eyed Crust., p. 105, 1853. Portobello and Musselburgh beaches (Howden; L. & H.). Taken occasionally in the dredge, in the vicinity of Inchkeith, and in the trawl west of May Island (S.F.B.).

Portunus holsatus, Fabricius.

Portunus holsatus, Bell, Brit. Stalk-eyed Crust., p. 109, 1853. Dr Leach found one amongst a number of specimens of *Portunus depurator* at Newhaven (L. & H.). One of the species commonly met with on the 'Oyster Banks' (Henderson).*

Portunus pusillus, Leach.

Portunus pusillus, Bell, Brit. Stalk-eyed Crust., p. 112, 1853. Off Prestonpans (Howden). We have frequently dredged it near Inchkeith, &c. (L. & H.). Largo Bay (S.F.B.).

* *Decapod and Schizopod Crustacea of the Clyde*, p. 10.

PLATYONYCHIDÆ.

Carcinus mœnas, Linné.

Carcinus mœnas, Bell, Brit. Stalk-eyed Crust., p. 76, 1853.
Between tide-marks, and in the laminarian zone; everywhere common.

Portumnus latipes, Pennant.

Portumnus latipes, White, Pop. Hist. Brit. Crust., p. 43.

Portumnus variegatus, Bell, Brit. Stalk-eyed Crust., p. 85, 1853.
Prestonpans and Portseaton (Howden). We have taken this species at Portobello (L. & H.). The Rev. A. M. Norman, in Part III. of *Mus. Nov.*, retains this species in Milne-Edwards' genus *Platyonychus*.

CORYSTIDÆ.

Atelecyclus septemdentatus (Mont).

Atelecyclus septemdentatus, White, Pop. Hist. Brit. Crust., p. 64, 1857.

Atelecyclus heterodon, Bell, Brit. Stalk-eyed Crust., p. 153, 1853.
Firth of Forth, rare (Goodsir). Portobello beach (M'Bain; L. & H.). One specimen taken by trawl-net west of May Island (S.F.B.).

Ctyroess-cassivelaunus (Pennant).

Corystes cassivelaunus, Bell, Brit. Stalk-eyed Crust., p. 159, 1853.
Off Inchkeith (M'Bain). Bass Rock, 24 fathoms (Metzger). Newhaven (C. W. Peach). 'We have dredged it in Aberlady Bay' (L. & H.). Occasionally in the trawl-net west of May Island (S.F.B.).

PINNOTHERIDÆ.

Pinnotheres pisum (Linné).

Pinnotheres pisum, Bell, Brit. Stalk-eyed Crust., p. 121, 1853.
Taken with the dredge associated with *Mytilus modiolus*, in the vicinity of Inchkeith (S.F.B.). Off Longniddry in 14 fathoms (L. & H.).

LEUCOSIDÆ.

Ebalia tuberosa (Pennant).

Ebalia Pennantii, Leach, Bell, Brit. Stalk-eyed Crust., p. 141, 1853. Firth of Forth, rare (H. Goodsir; L. & H.). One specimen among trawl material, west of May Island (S.F.B.).

Ebalia Cranchii, Leach.

Ebalia cranchi, Bell, Brit. Stalk-eyed Crust., p. 148, 1853.
2½ miles off Dunbar, in 25 fathoms (F. M. Balfour; L. & H.).

ANOMURA.

PORCELLANIDÆ.

Porcellana platycheles (Pennant).

Porcellana platycheles, Bell, Brit. Stalk-eyed Crust., p. 190, 1853.
Crail and Fifeness at low water (Howden); at Elie, and on the shore near N. Berwick (L. & H.).

Porcellana longicornis (Pennant).

Porcellana longicornis, Bell, Brit. Stalk-eyed Crust., p. 193, 1853.

Upper part of the Firth (Howden). Bass Rock, 24 fathoms (Metzger). Off May Island, in 8 fathoms, near Elie, and near Inchkeith (L. & H.). Not unfrequent among dredged and trawled material from between Inchkeith and May Island (S.F.B.).

LITHODIDÆ.

Lithodes maia (Linné).

Lithodes maia, Bell, Brit. Stalk-eyed Crust., p. 165, 1853.

This species is not uncommon near the mouth of the Firth. It is often obtained by fishermen near the Island of May (L. & H.). One specimen in deep water, west of May Island (S.F.B.).

PAGURIDÆ.

Eupagurus bernhardus (Linné).

Eupagurus bernhardus, Brandt, Middend. Sibir. Reise, Zool. i. p. 105.

Pagurus Bernhardus, Bell, Brit. Stalk-eyed Crust., p. 171.

Pagurus Ulidianus, W. Thomp. Rep. Brit. Assoc., p. 267, 1843; Bell, Brit. Stalk-eyed Crust., p. 180, 1853 (a dwarf variety). Very common within the littoral and laminarian zones.

Eupagurus pubescens (Kröyer).

Eupagurus pubescens, Stimpson, Proc. Acad. Nat. Sci. Philad. 1858, p. 75.

Pagurus Thomsoni, Bell, Brit. Stalk-eyed Crust., p. 372, 1853. West of May Island, 20 fathoms (Henderson). East of Inchkeith, 9 to 10 fathoms (S.F.B.).

Eupagurus sculptimanus (Lucas).

Eupagurus sculptimanus, Norman, Mus. Nor., pt. iii. p. 7, 1886.

Pagurus Forbesii, Bell, Brit. Stalk-eyed Crust., p. 186, 1853. Firth of Forth (Howden).

Eupagurus cuanensis (Thompson).

Eupagurus cuanensis, Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 75.

Pagurus cuanensis, Bell, Brit. Stalk-eyed Crust., p. 178, 1853. In *Turretella*, Firth of Forth (F. M. Balfour; L. & H.).

Spiropagurus Hyndmanni (Thompson).

Spiropagurus Hyndmanni, Norman, Mus. Nor., pt. iii. p. 7, 1886.

Anapagurus Hyndmanni, Henderson, Decapod and Schiz. Crust. Firth of Clyde, p. 27.

Pagurus Hyndmanni, Bell, Brit. Stalk-eyed Crust., p. 182, 1853. Off Musselburgh and Prestonpans (Howden; L. & H.). Three species dredged east of Inchkeith (S.F.B.).

Spiropagurus lævis (Thompson).

Spiropagurus lævis, Norman, Mus. Nor., pt. iii. p. 7, 1886.

Anapagurus lævis, Henderson, Decapod and Schiz. Crust. Firth of Clyde, p. 28, 1886.

Pagurus lævis, Bell, Brit. Stalk-eyed Crust., p. 184, 1853. Firth of Forth (Howden; L. & H.). Not unfrequent in the vicinity of Inchkeith (S.F.B.).

GALATHEIDÆ.

Munida rondelii, Bell.

Munida rondelii, Bell, Brit. Stalk-eyed Crust., p. 208, 1853.

Munida rugosa, Leach, Dict. des Sci. Nat., tom. xviii. p. 52.

Munida Bamffica, White, Pop. Hist. Brit. Crust., p. 89, 1857.

Not uncommon at Dunbar (R. Gray ; L. & H.).

Galathea squamifera, Leach.

Galathea squamifera, White, Pop. Hist. Brit. Crust., p. 87, 1857.

Galathea squamifera, Bell., Brit. Stalk-eyed Crust., p. 197, 1853. Common in the littoral and laminarian zones.

Galathea strigosa (Linné).

Galathea strigosa, Bell, Brit. Stalk-eyed Crust., p. 200, 1853.

Off the Bass Rock (Howden). Plentiful near Dunbar (R. Gray ; L. & H.).

Galathea nexa, Embleton.

Galathea nexa, Bell, Brit. Stalk-eyed Crust., p. 240, 1853.

Off Portseaton (Howden ; L. & H.).

Galathea intermedia, Lilljeborg.

Galathea intermedia, Lilljeborg, Ofvers. Vet. Acad. Förhandl., 1851, p. 21.

Galathea Andrewsii, Kinahan, Nat. Hist. Rev., vol. iv. pt. 2, p. 228; Trans. Irish Acad., 1871, p. 95. Firth of Forth (Dr Anderson ; * L. & H.).

Galathea dispersa, Bate.

Galathea dispersa, Bate, Proc. Linn. Soc. (Zool.), vol. iii. p. 3.

Commonly met with on the so-called 'Oyster banks' (Henderson).†

MACRURA.

ASTACIDÆ.

Homarus vulgaris, Milne-Edwards.

Homarus vulgaris, Bell, Brit. Stalk-eyed Crust., p. 242, 1853.

Homarus gammarus, Linné-Henderson, Decapod and Schiz. Crust. Firth of Clyde, p. 31, 1886. Firth of Forth, at many places at low water (Howden). Caught in considerable numbers for the markets on all the rocky coasts near the mouth of the estuary (L. & H.).

Nephrops norvegicus (Linné).

Nephrops norvegicus, Bell, Brit. Stalk-eyed Crust., p. 251, 1853.

This is a very common species in the lower parts of the Firth, and it is equally common in Rothesay Bay. It is frequently observed in the stomachs of large cod.

CARIDA.

CRANGONIDÆ.

Crangon vulgaris (Fabricius).

Crangon vulgaris, Bell, Brit. Stalk-eyed Crust., p. 256, 1853.

Common within the littoral zone where the shore is sandy, and occasionally taken with the dredge in moderately deep water.

* Proc. Roy. Phys. Soc. Edin., vol. ii.

† Decapod and Schizopod Crustacea of the Clyde, p. 10.

Crangon allmanni, Kinahan.

Crangon allmanni, Kinahan, Proc. Dublin Nat. Hist. Soc., vol. iv. p. 80, 1857. Bass Rock, 24 fathoms (Metzger; L. & H.). Taken with the trawl in deep water, west of May Island. This species is more frequently observed in the stomachs of cod and haddock than any other Crangon (S.F.B.).

Crangon nanus, Kröyer.

Crangon nanus, Kröyer, Nat. Hist. Tidsskr., iv. p. 231.

Crangon bispinosus, Bell, Brit. Stalk-eyed Crust., p. 268, 1853. Bass Rock, 24 fathoms (Metzger; L. & H.). One specimen, taken with the trawl, off Prestonpans (S.F.B.). This appears to be the first record of the occurrence of this species so far up the estuary.

PALÆMONIDÆ.

Hippolyte spinus (Sowerby).

Hippolyte spinus, Bell, Brit. Stalk-eyed Crust., p. 284, 1853. Newhaven (Leach). The species is rather common in the laminarian and littoral zones (L. & H.). One specimen, dredged near Inchkeith (S.F.B.). This species does not seem to have been yet recorded from the Clyde, the next species having been usually mistaken for it.

Hippolyte securifrons, Norman.

Hippolyte securifrons, Norman, Trans. Tyneside Nat. Field Club, vol. iv. p. 267, 1863. Off St Abb's Head, 40 fathoms (Metzger; L. & H.).

Hippolyte pusiola, Kröyer.

Hippolyte pusiola, Kröyer, Monogr. Fremstilling af Hippol. Nord. Arter., p. iii.

Hippolyte Barleei, White, Pop. Hist. Brit. Crust., pp. 124, 335.

Hippolyte Andrewsii, White, *loc. cit.* Newhaven, from the fishermen's lines (Henderson). Several specimens were taken with the dredge in the vicinity of Inchkeith. This seems to be the species referred to by Dr James Howden as being common at Crail.*

Hippolyte cranchii, Leach.

Hippolyte cranchii, Bell, Brit. Stalk-eyed Crust., p. 288, 1853. Rocks off Broxmouth, near Dunbar (F. M. Balfour; L. & H.).

Virbius varians (Leach).

Virbius varians, Norman, Mus. Nor., pt. iii. p. 8, 1886.

Hippolyte varians, Bell, Brit. Stalk-eyed Crust., p. 286, 1853. Firth of Forth in pools (Howden). Rocks off Broxmouth, near Dunbar (F. M. Balfour; L. & H.). Frequent in pools left by the receding tide, shore above Granton (S.F.B.).

Virbius fasciger (Gosse).

Hippolyte fascigera, Goose, Ann. and Mag. Nat. Hist., p. 153, 1853.

„ „ White, Pop. Hist. Brit. Crust., p. 119, 1857.

Virbius fasciger, Norman, Mus. Nor., pt. iii. p. 8, 1886. Several specimens of this species were taken with the hand-net amongst the weed at the edge of low water, at Cramond Island. It is easily distinguished when alive from all other British species of *Hippolyte* by the peculiar arrangement of

* Trans. Roy. Phys. Soc. Edin., 1853.

dark blotches and streaks on its integument, which is otherwise pellucid and almost transparent. There does not seem to be any previous record of its occurrence in the Forth (S.F.B.).

Padnalus annulicornis, Leach.

Pandalus annulicornis, Bell, Brit. Stalk-eyed Crust., p. 297, 1853.

A common species throughout the Forth; frequently observed in the stomachs of the haddock and cod.

Pandalus brevirostris, Rathke.

Pandalus brevirostris, Norman, Mus. Nor., pt. iii. p. 8, 1886.

Hippolyte Thomsoni, Bell, Brit. Stalk-eyed Crust., p. 290, 1853.

Firth of Forth (F. M. Balfour; L. & H.). One specimen dredged in deep water a little west of Inchkeith, October 1887 (S.F.B.). This appears to be a rare species in the Forth.

(?) *Palæmon squilla* (Linné).

Palæmon squilla, Bell, Brit. Stalk-eyed Crust., p. 305, 1853.

Frequent in rock pools near the mouth of the Firth (L. & H.).

Remarks.—The Decapod Crustacea here recorded as having been observed in the Firth of Forth, amount in number to nearly a half of the whole British species. Scarcely a third of them, however, are of frequent or common occurrence, and of several only a few specimens have as yet been noticed in the estuary. The common species of the Decapods are frequently observed among the contents of fishes' stomachs, and form a considerable part of the food of those fishes that feed at or near the bottom. It does not appear that the species of Crustacea belonging to this group are to any appreciable extent more abundant at one season than another, although some are found to frequent the littoral zone during the spring and summer months more than at other times, and *Hyas araneus* may be cited as an example of this. It is rather curious that this spider crab, though not confined so exclusively to deep water as the other species, *Hyas coarctatus* is yet frequently captured by the dredge in water of 10 or 15 fathoms depth, it is nevertheless very rarely found in the stomachs of fishes, even of that omniverous feeder the cod; whereas *Hyas coarctatus* is of common occurrence, especially in cods' stomachs, six, eight, and sometimes a dozen or more specimens being found in a single fish.

That *Hyas araneus* is more a littoral species cannot be given as a satisfactory reason for its practical exemption; that it is larger is a reason hardly more tenable, for cuttle-fish, Norwegian lobsters, and even sea-fowl are devoured by cod; nor are they so active in their movements as to be able to escape by that means more readily than other crabs. Whatever the reason is, it seems evident that fishes, as well as fishermen, have a decided dislike to *Hyas araneus*.

The common food fishes, throughout all stages of their growth, feed very generally and largely on species belonging to nearly all the orders of Crustacea, both in their young and mature conditions. Where Crustacea are abundant, it may reasonably be expected that fishes will be more or less numerous. It goes without saying, then, that the study of the Crustacea,—their distribution, habits, and development,—forms by no means an unimportant part of fishery investigations.

With comparatively few exceptions, the various species of Decapods frequent the bottom, seeking shelter under stones, among sea-weed, Loophytes, or, as is the case with some, burrowing in the mud or sand, and sometimes to a considerable depth. The Cumacea seem also to frequent the bottom. The Schizopoda, or at least very many of them, are,

on the other hand, like the Calanidæ among the Copepoda, and the Hyperiidæ among the Amphipoda, pelagic in their habits. The phosphorescence of the sea is also apparently to some extent due to the power they have—notably the species of the Euphausidæ—of emitting light from various parts of their bodies; and it is a curious circumstance that it is those species which have been observed to have preeminently the power of becoming luminous that are most frequently found in the stomachs of herrings, namely, *Nyctiphanes* and *Boreophausia*. Whether the property of emitting light which these Schizopods possess has anything to do with their being so commonly selected as food by the herring, cannot be easily answered, though it is probable that their luminosity may have some connection with it.

The somewhat singular auditory organs observed in many of the Mysidæ are very interesting. They are conspicuous owing to their glistening transparency; they appear as clear circular vesicles near the base of each of the inner caudal lamellæ, which are at this part suddenly enlarged to afford space for the vesicles. Viewed with a low power, each vesicle appears to be formed of concentric zones or laminæ, which are alternately more and less clearly transparent; with a moderately high power, the auditory ossicle may be observed. The position of the auditory organs here referred to seems confined to the Mysidæ. The Cumaceæ according to Claus do not possess auditory organs.

The distribution of the Ostracoda, as might be expected from their frequenting the mud, sea-weed, and zoophytes at the bottom, is, like that of the Decapods, little influenced by the various seasons. The free-swimming Copepoda are decidedly different in this respect. During the later months of spring, and in summer and early autumn, they are at times captured in great abundance by the surface-net; whereas during the colder months, comparatively few are to be met with, even though the net be sunk to a considerable depth. In April and May I have also found the larval or free-swimming forms of *Balani* exceedingly numerous—much more so than at any other season. If adult *Balani* be collected about this time, and left in sea-water for an hour or two, swarms of these larval forms may be observed swimming about. It is probable that during this time when the sea around our coasts is swarming with these very minute organisms, the herring, and possibly other fishes also, may make use of them as food, by drawing them into their mouths along with the water of respiration, and retaining them while the water passes through the opercula, as Dr Möbius suggested; but there is no doubt that herring can, and do, discriminate between one form of food and another, and purposely capture the organisms on which they generally feed, whether Copepods, Amphipods, or Schizopods.

The importance of this extensive class of organisms—perhaps the most extensive among the Invertebrata—is a sufficient reason, if only from a commercial point of view, for its being carefully and thoroughly studied.

In the list here given, over 230 species of Crustacea are recorded as occurring in the Firth of Forth, including 41 species of Ostracoda, 42 of Copepoda, and 13 Schizopods.

In the list prepared by Leslie and Herdman, 99 species are enumerated; and Dr Henderson in his paper added other 21 species, which, including a few doubtful forms, brought the total up to 120 species. The number of species in the present list, exclusive of the two additional groups, Ostracoda and Copepoda, and leaving out doubtful forms, is about 150, which shows that the investigations carried out during the past year under the directions of the Fishery Board have been fairly successful in adding to our knowledge of the distribution of this important class of organisms.

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